

*Bailey (L.W. (65) 50*

NOTES

ON

NEW SPECIES OF MICROSCOPICAL ORGANISMS

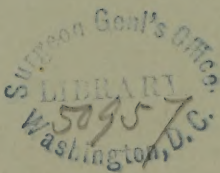
FROM THE

PARA RIVER, SOUTH AMERICA.

*Bind cover in front*

BY LORING W. BAILEY, *B*

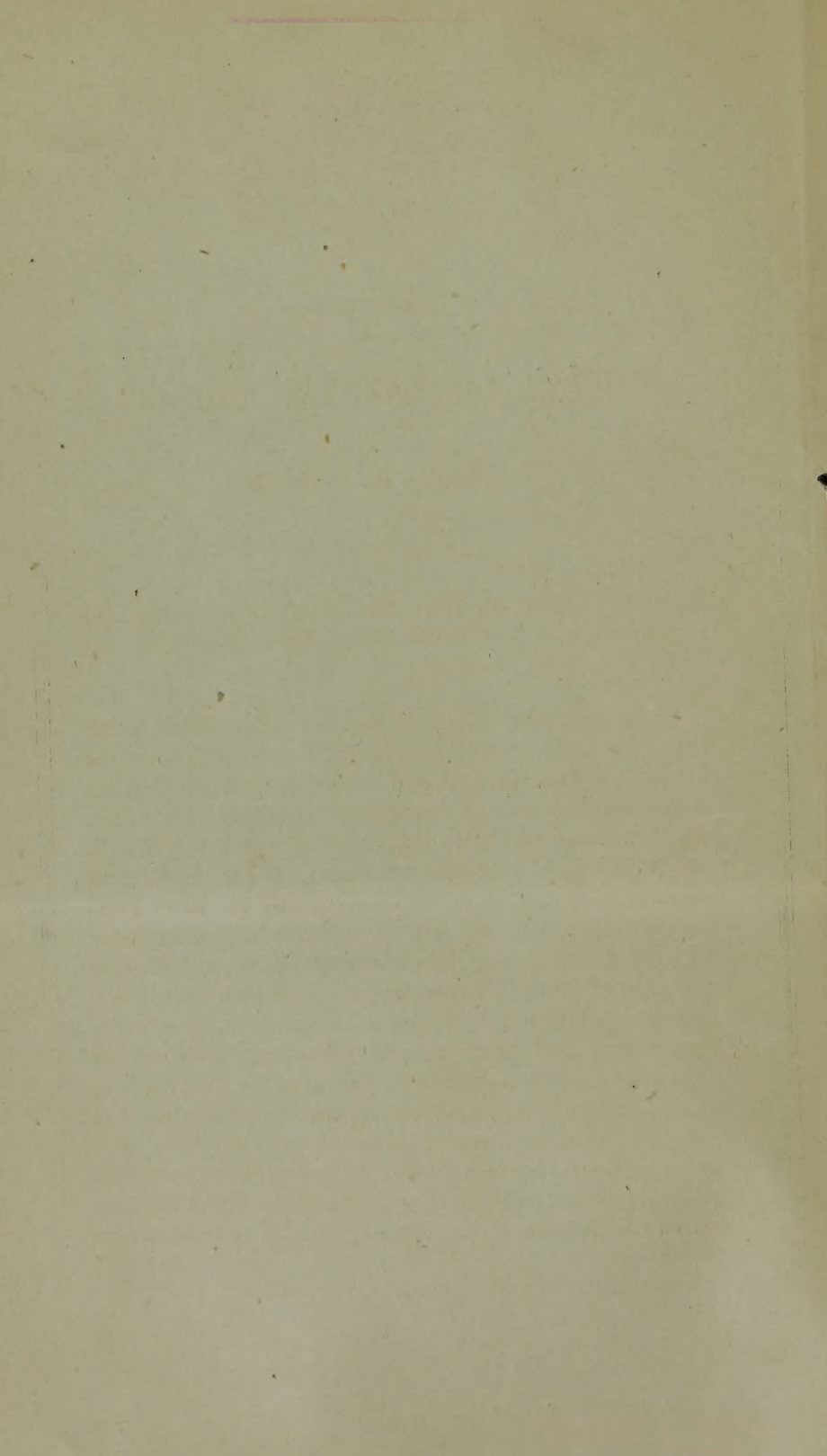
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ART. V.—*Notes on New Species of Microscopical Organisms, chiefly from the Para River, South America.*  
By LORING W. BAILEY.

IN the year 1854, the U. S. Exploring Expedition, under the command of Capt. Lee, in the course of their cruise in the brig *Dolphin*, collected on the eastern coast of the American continent a number of soundings and algæ, which were at that time submitted to my father, Prof. J. W. Bailey, for microscopic examination. One locality, in particular, the mouth of the Amazon and the River Para, proved very rich in rare and new species of diatomaceous and allied organisms. These were at once submitted to careful study, and arrangements made for their speedy and accurate publication. As far as I can learn, it was designed that the description of these organisms should accompany the Report of the "Cruise of the *Dolphin*" to Congress, and two plates were prepared in outline for that purpose. For some reason, which I have not been able to trace, neither the plates nor the descriptions have ever been published, and a few proof-copies in my possession are all that remain of the original work. As most of the



forms here found are peculiar to these localities, and are still for the most part unknown to microscopists, I have endeavored to complete the publication of these plates, by the study of the original forms in the possession of the Society, and by means of pencil notes, accompanying camera sketches, among the Memoranda of the Microscopic Collection. Most of the forms contained in the plates I have satisfactorily identified upon the slides, and have carefully verified all the descriptive notes, which accompany the sketches. It has of course been impossible for me to supply from such scanty material, and from specimens mounted nearly six years ago, all the minute details desirable in the delineation of such objects, but yet I trust sufficient is given to render the species distinct and of easy recognition. Where a doubt was entertained as to the character of surface-markings, I have considered it of more advantage to leave such details unsupplied, than to add what future and better specimens might prove erroneous.

Fig. 1. AMPHORA DELPHINA, L. W. B., nov. sp. Frustules elliptic-oblong, with broad, slightly rounded ends; valves very minutely and transversely striated; nodules very large, extending in a bar across the centre of the valve; valves in front view gibbous at the centre; outer portions canoe-shaped; aspect hyaline; terminal nodules distinct.

*Hab.* Para River.

This species, which is very rare even in this locality, in general characters resembles *Amphora laevis* of Gregory. It differs from that species in the sides in F. V. being curved outward so as to be quite gibbous, instead of being incurved as in *A. laevis*, while the nodule is much larger, and contracts towards the connecting membrane. The striations could just be seen with Spencer's  $\frac{1}{16}$  in. objective, and oblique light. With moderate powers the aspect is

hyaline. As no name was assigned by its discoverer, I have ventured to propose the above, taken from the name of the vessel by which these soundings were collected.

Figs. 2, 3. *AMPHITETRAS CUSPIDATA*, *Bail.*, nov. sp. Sides concave; lateral view quadrangular, with angles produced and rounded; cellules distinctly hexagonal; connecting membrane minutely and decussately punctate.

*Hab.* Para River, and Lat.  $0^{\circ} 45' 50''$  S. Long.  $48^{\circ} 11' 25''$  W.

I have detected several specimens of this species, and compared them carefully with *Triceratium favus*, of which several varieties occur in these soundings. Although the hexagonal areolations are somewhat smaller than usually represented in *Tr. favus*, yet in this locality there are several varieties of this species, which differ considerably in this respect; and as a five-sided variety or *Amphipentas* also occurs with similar areolation, I am disposed to regard these forms as all of one species. It is probable, also, that *Amphitetras favosa*, H. et B., which differs only in the sides being straight instead of concave, may be another variety of the same species. This form was found at the depth of thirty-three fathoms.

Figs. 4 and 5. *CYCLOTELLA KÜTZINGIANA*? —. This species, which, in the list of forms detected by him, my father doubtfully refers to *Discoplea Kützingii*, is probably a variety of *C. Kützingiana* of Smith. The central portion is large, elevated, and irregularly punctate; the striæ are minute and closely radiant, reaching the margin, but interrupted before reaching the margin by a finely undulate circle.

I would here remark, as this species of *Cyclotella* is described by some as with a punctate, and by others as with a striate margin, that either appearance may be produced, in this variety at least, by a simple change of focus; the undulate line when *in focus* appearing as if made up of

circular puncta, but when out of focus giving the margin a beautiful and delicate striated appearance.

DITYLUM, BAIL., nov. gen.

Silicious, free, simple, one-celled, bivalve, consisting of two triangular pyramids applied base to base; vertices of one or both pyramids terminating in acute spines.

Figs. 6, 10, 11. *DITYLUM TRIGONUM*, Bail., nov. sp. Two nearly equal triangular pyramids, applied base to base; base of each pyramid triangular, with the angles rounded; vertex of each pyramid terminating in an acute spine; valves punctate, in radiant interrupted lines; frustules equally bivalve, turgid; lateral view triangular.

*Hab.* San Antonio Bay, Para River, 4 fathoms.

Figs. 12-14. *DITYLUM INÆQUALE*, Bail., nov. sp. Differs from *D. trigonum*, B., in having one side turgid, the other side less turgid, and rising considerably within the margin; punctate all over.

*Hab.* San Antonio Bay.

Of this curious genus, to which the name of *Grymaia* was first given by its discoverer, two species have been detected. They differ chiefly in the inequality of the valves. In the side view of *D. trigonum*, when the spine appears as if reduced to a dot, the form very nearly resembles the same view of *Triceratium alternans*, B. Both species bear some resemblance to some forms of *Chætoceros* and *Di-cladia*.

Fig. 7. *MELOSIRA GRANULATA*, L. W. B., nov. sp. Slender; joints cylindrical and punctate in parallel rows; joints separated by narrow bands devoid of striæ, all closely connected; end of filament armed with (6) spines of greater length than the narrow bands; joints longer than broad, closely binately conjoined.

*Hab.* Para River.

I have detected several filaments and detached frustules



of this species in the surface-water of the Para, and have always found them armed with spines at the margin. In some cases these spines are considerably longer than represented in the figure. The parallel puncta are very distinct.

Fig. 8. *LITHODESMIUM CONTRACTUM*, *Bail.*, nov. sp. I can give no more accurate idea of this form than is afforded by the figure in the plate, as the specimen was lost before fully examined, and no notes have been found to explain it. It resembles Ehrenberg's *Lithodesmium undulatum*, but its nature and position have not been fully ascertained. A similar form was found by my father in a salt marsh near Greenport, N. Y.

Fig. 9. *COSCINODISCUS? TENUIS*, *Bail.*, nov. sp. Shell excessively thin and hyaline, with radiant rows of minute cells, a small central inconspicuous rosette, and a radiate margin; puncta visible with moderate powers.

*Hab.* Para River.

This species near the margin resembles an *Actinocyclus*, but shows no colors or rays in the central portion. Several specimens occur, the puncta being excessively delicate and close. The front view is represented in Fig. 9 a. The disc is comparatively large, but so delicate and thin as to be found with difficulty, even when its position is recorded. With the low objectives, it looks like a mere circular haze.

I cannot omit saying that I feel considerable doubt as to the genus of the form here described. I have seen and carefully studied the specimen from which the figure was taken, and have seen distinctly the characters above given; but I have also found another and more perfect form, in which there are three distinct marginal processes, which would assign the form to the genus *Eupodiscus*. This latter specimen is quite as thin and fine, with radiant rows of excessively minute puncta and a margin resembling

*Actinocyclus*. I have therefore marked the genus as doubtful, although not originally considered so. Even in the identical specimen recorded first as *Actinocyclus* and then as *Coscinodiscus tenuis*, I think I have distinctly seen at least two processes, as in *Eupodiscus*. There are several varieties of *Eupodiscus* in this locality, one nearly allied to *E. radiatus*, but with very short processes. Many of them resemble *Coscinodisci*.

Fig. 16. NAVICULA SEPTENARIA, *Bail.*, nov. sp. Minute, in general outline rhombic; sides undulated, producing seven wide parts and six constrictions; central nodule and line distinct; striæ wanting or obscure.

*Hab.* Para City.

This form, which is possibly a fresh-water species, would be easily mistaken with moderate powers for some form of *Spongiolites*; but with the highest powers it is exceedingly regular and graceful, the nodule is distinct, and the median line well marked. The only specimen seen is opaque and porcelainous, showing with the highest powers no signs of striæ. I think, however, there can be no doubt of its naviculoid nature.

Fig. 17. PLEUROSIGMA ———, nov. sp.? This would seem to be a variety of *P. inflatum* of Shadbolt. I have been unable to find the original specimen, and can therefore only trust to the outline as originally drawn. Several varieties of this genus occur here.

Figs. 18 and 19. HYALODISCUS ———. This possibly may be a variety of *H. lævis*, from the description of which it differs only in size, but from one poor specimen I have been unable to ascertain its specific characters. It is quite small, the markings are coarse compared with those of *H. subtilis* or *H. Californicus*, and the suture irregular and jagged. The rim is quite broad, and the valves very convex. The centre is densely granulate. Possibly it may be some form of *Podosira*.



Fig. 20. NAVICULA ———. This form is doubtfully referred by its observer to *N. bacillum*, E. The sides are nearly straight, the ends rounded, the striæ transverse, close, and very faint. The median line has a faint line running through its centre, which is prominent near the ends, but grows suddenly faint at a short distance from them.

Fig. 21. NAVICULA ———. This form is probably *N. lineolata*, Ehr. = *N. serians*, K., but as neither the description nor the figures given of this species by these writers is sufficiently minute, it is difficult to recognize. In the present specimen, the longitudinal lines are distinct with low powers, and with the highest powers may be seen to be separated by transverse lines, resolvable into dots. Neither Ehrenberg nor Kützing allude to any transverse lines whatever, but they may not have sufficiently searched for them.

The next form (Figs. 22 and 23) I have been unable to find, and only retain the form in the plate that it may be identified if found at any future period.

Fig. 24. This form, I have no doubt, is *Navicula gastrum* of Ehrenberg and Kützing = *N. placentula*, Ehr. The striæ are faint, close, and slightly radiant, resolved into dots by  $\frac{1}{16}$  in. objective.

Fig. 25. BIDDULPHIA TENUIS, L. W. B., nov. sp.? Shell excessively thin, quadrangular, with the whole surface decussately punctate; puncta under low powers appear like lines; lateral view elliptic, with acute, slightly produced apices.

The form represented in Figs. 25 and 26, for which I have substituted the name of *Biddulphia* instead of *Denticella* originally assigned to it, is probably, I think, a variety of *Zygoceros Mobiliensis*, B. = *Biddulphia Baileyi* of Smith. The two, however, were probably carefully compared by their discoverer, and I therefore hesitate to abandon the distinction drawn by him. In the pencil sketch from

which this figure was taken, my father describes the frustule as "*excessively* thin, in front view quadrangular," and does not even suggest a comparison with *B. Baileyi*, Sm. The descriptions, however, closely correspond, and I can discover no good reason for their separation.

It will be seen, by reference to the plate, that no less than five forms of *Biddulphia* are represented, each with more or less of resemblance to the others. Fig. 25 very closely corresponds to the figure and description of *Zygoceeros Mobiliensis*, (Bail. Mic. Contrib. Plate 2, Fig. 34,) while Fig. 34 of the present plate corresponds closely with Fig. 35 of the Microscopical Contributions, differing only in having one spine instead of two. But the other spine is again present in Figs. 35 and 69, while in Figs. 66 and 68, which he assigns to *Zygoceros occidentalis*, no spines whatever are apparent. As the *Z. Mobiliensis* was published in 1850, and the above not drawn until 1854, it is a little singular that the resemblance should not have been noticed. My father certainly did not regard the number of spines as of specific importance, as he assigns the same name of "*trinacria*" to both Figs. 34 and 35. To Fig. 66 he assigns the specific name of "*occidentalis*." I cannot, however, discover from the original objects any essential difference in structure, and am inclined to think that the number of the spines is not of specific importance. I regard all the forms, therefore, above alluded to, as varieties of *Biddulphia Baileyi*, Sm. There is great difference in size, it is true, between these forms, but intermediate sizes are not uncommon.

Fig. 26. *EUNOTIA ANISODON*, Bail., nov. sp. Large; venter concave; dorsum convex, with two ridges symmetrically arranged, with the dorsum of each ridge composed of three subordinate ridges; ends produced and broadly rounded; striæ minute, converging slightly.

*Hab.* Para River.

Fig. 27. *EUNOTIA* ———. This is possibly a variety of *Eunotia dzyga* of Ehrenberg, but has only two teeth approximate at the middle instead of four. The striæ are fine, but distinct.

Figs. 28, 29. These were doubtfully referred to *Fragilaria constricta* of Ehrenberg = *F. undata*, S. B. D., which is represented as sometimes constricted and sometimes inflated at the middle. These two are probably of the same species, but *F. undata* is a fresh-water form. As, however, it is a widely diffused species, and occurs on this continent, this form may possibly be of identical species with the British variety.

Figs. 30 and 31. *PINNULARIA DILATA*, Bail., nov. sp. Small, linear; in lateral view slightly dilated at centre and ends; ends obtuse and rounded; median band large, central nodule distinct. In front view panduriform; the constrictions meeting the connecting membrane at the centre. Striæ fine, close, and nearly parallel.

*Hub.* Lat.  $0^{\circ} 29' 58''$  N. Long.  $45^{\circ} 58' 33''$  W. Para River.

The front view of this species resembles an *Amphiprora*, the lateral view a small *P. nobilis*. It is only on turning a frustule over, that its true nature is apparent. The striæ in both views are fine and nearly parallel. The form was found at the depth of thirty-three fathoms.

Fig. 32. *STAUROPTERA* ———. This form, which is doubtfully referred to *Stauroptera cardinalis* of Ehrenberg, does not at all agree with Kützing's figure of that species, nor can I regard it as identical with *Stauroptera aspera*, which it more nearly resembles. It is not so large and stout as *S. cardinalis*, and the sides taper more, while it differs from the *S. aspera* in the striæ being lines not resolvable into dots, and of considerable fineness. Moreover the stauros is not dilated, and reaches the margin. It ap-



proaches much more nearly to *Pinnularia stauroneiformis*, which apparently also occurs here.

Fig. 33. This form I have failed in accurately determining. It bears considerable resemblance to *Navicula pusilla*, Sm., in outline, but apparently has a large and distinct cingulum passing over and around the central nodule. It also resembles a form doubtfully referred by Kützing to *Epithemia* (*Epithemia? cingulata*, Kütz., *Bacillarien*, Taf. 29, Fig. 66). Without the corresponding front view, it is impossible to determine its nature, although I am disposed to regard it as a true *Navicula*, of a new species. The striae are distinct, radiant, curving slightly towards the apices. The median nodule is also distinct.

Figs. 34 and 35. *BIDDULPHIA TRINACRIA*, *Bail.*, nov. sp.? I have already spoken of these forms under Fig. 25 as probably varieties of *Biddulphia Baileyii*, Smith. Fig. 35, under the highest powers, can be resolved into circular granules, decussately arranged, which are somewhat larger on the connecting zone than on the valves. The processes are also granulate to their extremities.

Another form of this singular species has the valves and connecting membrane reduced almost to a line, while there are two long processes on each valve which curve towards each other, and have between them one straight, sharp spine, somewhat longer than the processes.

Fig. 36. *SURIRELLA DUPLEX*, *Bail.*, nov. sp. Large, oblong; in front and lateral views panduriform; ends broadly rounded; median band panduriform; costae close, distinct, and externally dilated.

*Hab.* Para River.

Fig. 37. *SURIRELLA* ———. Probably a variety of *Surirella decora*, Ehr. *Vide* Mikrogeol. Pl. XV.

Figs. 38, 39, and 40. *CAMPYLODISCUS COLLECTUS*, *L. W. B.*, nov. sp. Large, saddle-shaped; in front view un-

dulate; in side view broadly elliptic; costæ conspicuous, short, and radiant.

*Hab.* Para River, at Una.

This singular form was assigned by its discoverer to the genus *Surirella*, but I have now no hesitation in transferring it to the allied genus *Campylodiscus*. One of the chief points of interest in this species is the great width attained by the central or interstitial portion, which, in this genus, as in the *Coscinodisceæ*, is usually reduced to a narrow ring. It resembles *Surirella Campylodiscus* in some respects, and a comparison was suggested by its discoverer to *S. striatula*, Turp., but I think it is certainly entirely distinct from either.

Figs. 41-45. *DICLADIA*? *MAMILLANA*, *Bail.*, nov. sp. Smooth? valves sometimes equal, sometimes unequal; mammillated, turgid; one or both valves with conical mamillæ connecting at the base; valves separated by a median band not striated (?); styles and spines wanting.

Var. *α*. Valves with two cones on one side, and none on the other.

*β*. Valves with only one cone on each side. The lateral view resembles a *Hyalodiscus*.

*γ*. Valves with one cone on one side, two on the other.

*δ*. Valves with two cones on each side.

This species, which is doubtfully referred to the genus *Dicladia*, corresponds very closely to some stages of growth in *Dicladia capreolus*, as figured by Brightwell, *Mic. Journal*, Vol. IV. page 105. Moreover, Fig. 74 of the 2d Plate seems also to be but a stage of growth of *Dicladia capreolus*, from which the lower valve has been broken off. The latter are quite common in these soundings, and were figured by my father as species of *Chatoceros*. I am, however, disposed to regard them all as stages of growth of *Dicladia capreolus*. The number of mamillæ varies from one on each side to two on each side. The

valves are, I believe, smooth and imperfectly silicious. Several figures illustrating the growth of this species may be found in Mic. Journ. Vol. IV., Pl. VII.

Fig. 46. *TERPSINOE MAGNA*, *Bail.*, nov. sp. Very large, oblong, quadrangular, with a variable number of note-like costæ, but with no transverse bars; side view like that of *Terpsinoe musica*, Ehr.; valves minutely granulate, as in *T. musica*; connecting membrane minutely, decussately punctate.

Figs. 50, 51. *TERPSINOE TETRAGRAMMA*, *Bail.*, nov. sp. Small quadrangular; each valve marked with two inward-bent costæ; connecting membrane marked with two horizontal and one vertical bar, which do not cross the valves. Side view consisting of one large, nearly circular inflation, with two small terminal compartments; puncta fine.

*Hab. Para.*

Fig. 54. *TERPSINOE MINIMA*, *Bail.*, nov. sp. Small, quadrangular, with slightly undulate ends; valves divided into three compartments (?) by two transverse bars at each end, and one at the centre, which cross the valves and connecting membrane; valves also marked by two short costæ on each side of the central single bar.

I have here ventured to describe, as new and distinct species, no less than three forms more or less resembling Ehrenberg's *Terpsinoe musica*, Figs. 52 and 53, which also occurs in this locality. These figures were doubtless originally drawn as distinct, and were intended in part to illustrate the variability of the bars and music-like costæ. It is probable that at this time my father regarded the number of these notes as of specific importance, as appears from the names *tetragramma* and *octogramma* severally assigned to them. These can hardly now be accepted as specific characters, but in the forms here represented we have other and much more marked differences. Thus Figs. 50 and 54 differ not only in the number of constrictions, but



also materially in their internal structure. Fig. 51, the side view of Fig. 50, has only one very large median inflation, with two very small terminal inflations. The centre of the frustule in front view is divided up by transverse bars into nearly equal squares, as in *T. musica*, E., while in Figs. 46, 47, and 52, which in other respects nearly resemble *T. musica*, we find no such transverse bars. Again, in Fig. 48 there are four horizontal bars, but no vertical.

It is possible that these should merely be considered as varieties, but they were not so regarded by their discoverer, and I have concluded to describe them as distinct species. The species represented by Fig. 47 is less coarsely granulated than the varieties of *T. musica* occurring with it. The granules of Fig. 46 agree with those of *T. musica*.

POLYMYXUS, BAIL., nov. gen.

Silicious, free, simple, bivalve; in front view quadrangular, with undulate ends; in lateral view circular; valves composed of curved ridges, appearing in front view like mamillæ, but in lateral view tapering to the depressed and stellate centre; summits of ridges armed with minute spines (?).

Figs. 55-59. POLYMYXUS CORONALIS, L. W. B., nov. sp. Frustules large, symmetrical, bivalve; in front view quadrangular with mammillated ends; in lateral view circular; lateral surfaces of valves elongated into projections which in front view appear like mamillæ but in oblique view taper down to the depressed centre; summits of the elevations terminated by minute spines on the margin of the shell; valves and median band minutely punctate.

*Hab.* Para River, and mouth of Amazon.

This beautiful species, which makes up the great bulk of the soundings of the Para, seems to be confined almost solely to this one locality. I have detected one specimen

in soundings from Yeddo Bay, but this may have been an accidental admixture. Its rarity is sufficiently attested by the fact, that although seen in this locality six years ago, it is still undescribed, and I believe unknown to most microscopists. It is exceedingly beautiful, and difficult to describe. In the lateral view the centre of the valve is destitute of puncta, and is of a stellate form corresponding to the number of cones, with which it is connected by roof-like ridges. The striæ are fine, and parallel to the surface of the connecting ridges. A single valve very closely resembles a crown. Only one species has yet been noticed, in which the number of lateral projections varies from six to ten, the usual number being seven. There is also considerable diversity of size.

Figs. 60 and 61. *TRICERATIUM SHADBOLTHI*, *Bail.*, nov. sp.? Sides concave; in front view constricted beneath the processes; concave sides decussately punctate; lateral surface bearing distinct rows of short, curved setæ, and three long, sharp spines, near the bases of the processes.

*Hab.* San Antonio Bay.

The side view of this beautiful species can scarcely be distinguished from *T. contortum* of Shadbolt, from which in this view, it differs chiefly in the straightness and sharpness of the spines, which project outwards. In front view, however, they are easily distinguished. The sides are concave, instead of straight, the spines are closer to the processes, and are comparatively short, projecting outwards. I regard this as of a different species from *T. contortum* of Shadbolt, with which it was carefully compared by both my father and myself. Several specimens occur in this locality. It is probable that the two figures 60 and 61 were drawn from different specimens, which would account for the difference of size. I have omitted the details of Fig. 60, as I have been unable to find a similar specimen.

Figs. 62-64. *SYRINGIDIUM AMERICANUM*, *Bail.*, nov. sp.

"Frustules minute, punctated; central portion quadrangular; valves unequal, one with a quadrate base suddenly contracted, and then tapering into a pyramidal spine, terminated by a mucro; the other valve sub-globose, with two short basal processes, each ending in a spine."

*Hab.* Para River, and mouth of Amazon.

One species of this singular genus, the *Syringidium Americanum*, has been figured in the last edition of Pritchard's Infusoria, from figures sent in letters to the authors of that work. The figure there given is much larger than the present ones, and needs no comments. One species at least, however, still remains undescribed, which may be characterized as follows.

Fig. 65. SYRINGIDIUM SIMPLEX, *Bail.*, nov. sp. Frustules minute, punctated; central portion quadrangular, larger and stouter than in *S. Americanum*; valves unequal, both gradually tapering into pyramidal cones, one of which terminates in a mucro, the other in a minute, sharp spine; valves nearly symmetrical; no basal processes as in *S. Americanum*.

*Hab.* Para River.

It will be noticed that Fig. 64, although called *S. Americanum* above, differs considerably from Figs. 63 and 62. I am not willing, however, to declare them distinct, as they were not originally called by different names. I have found also, from this same locality, another specimen, differing considerably from either of the above, which will be figured on some future occasion. If Fig. 64 should be considered as distinct from *S. Americanum*, I would suggest the name of "*occidentale*," which was originally given to all three of these forms.

Figs. 66-68. ZYGOCEROS OCCIDENTALIS, *Bail.*, nov. sp.?

Fig. 69. DENTICELLA TRINACRIA, *Bail.*, nov. sp.?

I have already spoken of these forms, regarding them as varieties of *Zygoceros Mobiliensis*, B.



Fig. 70. *NITSCHIA OBLONGA*, *L. W. B.*, nov. sp. Small, linear, with sub-acute apices; valves a little narrower in the middle than at the ends, but with no central constriction; marginal puncta small, close; surface minutely punctate in transverse parallel striæ.

*Hab.* Para River.

Fig. 71-73. *ZYGOCEROS HEMITROPUS*, *Bail.*, nov. sp.? = *BIDDULPHIA HEMITROPA*, *L. W. B.* Frustules large, turgid; lateral valves minutely punctate in rows, with conical processes; processes of one valve at right angles to those of the other; lateral view minutely punctate, circular, with two processes; median band straight or undulate, finely striated.

*Hab.* Para River, and Lat.  $0^{\circ} 45' 50''$  S., Long.  $45^{\circ} 11' 25''$  W.

This species is almost identical with a form figured in Smith's Synopsis as *Biddulphia radiatus*. This, however, has no trace of the spines there figured. My father has marked in Smith's Synopsis the name *B. radiatus* as incorrect, substituting for it that of *Eupodiscus radiatus*, and perhaps the above form should be referred to the same genus. It is very abundant in the soundings from the Para.

Fig. 74. *DICLADIA*? ———. I have already spoken of this form under Fig. 41. It occurs in the Para quite commonly.

Fig. 75. *GOMPHONEMA* ———. This form was doubtfully referred to *Gomphonema sphærosphorum*, Ehr., but as I have been unable to find the original form, or any very like it, I cannot compare them. The striæ are transverse, and not very close.

Fig. 76. *NITSCHIA PUNCTATA*, *Bail.* = *N. BRIGHTWELLII*? *Kitton*. I cannot discover any essential difference between the forms of these two species, and they are probably identical. *N. Brightwellii* is represented in Pritchard's

Infusoria, as somewhat larger and more coarsely marked, with the puncta arranged in circles, which I have not observed in this specimen, but in other respects they agree exactly. It is strongly punctate as at *a*, but shows no signs of striæ.

*Hab.* Para River.

Fig. 77. *NITSCHIA MESOLEPTA*, *Bail.*, nov. sp.? Small, linear in side view, with acute apices; two rows of puncta approaching at the middle; striæ wanting or obscure; valves tapering from the centre to the slightly dilated, acute apices.

*Hab.* Para River.

This form, under the name above given, was doubtfully marked as a variety of *Nitschia linearis* of Smith. It seems, however, to me, to be distinct in structure, and the latter is a fresh-water form.

Fig. 78. The scale here represented was found accompanying the original sketches, and I believe applies equally to all the figures, except perhaps to those of *Coscinodiscus? tenuis*, and the lateral view of *Polymyxus*. As the original proofs have been almost exactly reproduced, and the identical specimens could not always be found, I have been unable to verify the measurements. This scale is, I believe, equally magnified with the other figures.

I have now described as accurately as it is possible to do, from specimens which have been six years mounted in balsam, without fresh and free species to compare, the new and doubtful forms contained in this remarkably rich locality. The great bulk of the soundings consists, as I have before said, of the beautiful *Polymyxus coronalis*. Of the other species, *Cyclotella Kützingiana? Biddulphia tenuis*, *trinacria*, &c., and the different *Surirellas*, are among the more common forms; *Ditylum* and *Syringidium* are by no means rare, while *Navicula*, *Pinnularia*, and *Coscinodiscus* also

occur in considerable numbers. Many of the forms from considerable depths, as *Polymyxus*, are found also in the surface water, showing them to be recent species. I now proceed to give a list, first of the localities, and then of the species they contain.

The specimens examined are marked as follows :

No. 3. Para River at San Antonio Bay. Depth, 4 fathoms.

No. 16. Para River, off Tarpu Point.

No. 15. Latitude  $0^{\circ} 45' 50''$  S.; long.  $48^{\circ} 11' 25''$  W. Depth  $6\frac{1}{2}$  fathoms.

No. 5. Para River at Una, flood tide.

No. 11. Latitude  $0^{\circ} 29' 58''$  S.; long.  $45^{\circ} 58' 33''$  W. Depth 33 fathoms.

No. —. Para City.

The following table contains all the species observed in the above localities, and they are for the most part given with the names originally assigned to them. Those marked with stars are believed to be new, and are described in the preceding pages.

<i>Acanthes</i> —, fragment.	<i>Di cladia</i> <i>Capreolus</i> ?
<i>Actinocyclus</i> .	“ <i>mamillana</i> , B.*
<i>Actinoptychus</i> <i>senarius</i> , Ehr.	<i>Dictyocha</i> <i>fibula</i> , Ehr.
“ <i>denarius</i> , Ehr.	<i>Diploneis</i> .
“ 13 rays.	<i>Discoplea</i> <i>Kützingii</i> , B. = <i>Cyclotella</i>
<i>Amphitetras</i> <i>cuspidata</i> . B.*	Kütz. Sm.
<i>Amphora</i> <i>ovalis</i> , K.	<i>Ditylum</i> <i>inæquale</i> , B.*
“ <i>delphina</i> , L. W. B.*	“ <i>trigonum</i> , B.*
<i>Biddulphia</i> <i>tenuis</i> , L. W. B.* = B. Baileyi,	“ —————
leyi, Sm.	<i>Eunotia</i> <i>anisodon</i> , B.*
“ <i>trinacria</i> , B.* = B. Baileyi,	“ <i>dizyga</i> ? Ehr.
Sm.	<i>Eupodiscus</i> —, B., nov. sp., allied
“ <i>tridentata</i> , Ehr.	to <i>E. radiatus</i> .
<i>Cerataulus</i> <i>turgidus</i> , Ehr.	<i>Fragillaria</i> <i>constricta</i> ?
<i>Coscinodiscus</i> <i>eccentricus</i> , Ehr.	<i>Gomphonema</i> <i>sphaerosporum</i> ? Ehr.
“ <i>gigas</i> , Ehr.	<i>Grammatophora</i> ?
“ <i>lineatus</i> , Ehr.	<i>Hyalodiscus</i> ?
“ <i>oculus</i> <i>iris</i> , Ehr.	<i>Lithodesmium</i> <i>contractum</i> , B.*
“ <i>subtilis</i> , Ehr.	<i>Melosira</i> <i>granulata</i> , L. W. B.*
“ <i>tenuis</i> , B.*	“ <i>sulcata</i> .



<i>Navicula bacillum?</i> Ehr.	<i>Surirella collecta</i> , B.*
“ <i>Baltica</i> .	“ <i>decora</i> , B.*
“ <i>lineolata?</i> Ehr.	“ <i>duplex</i> , B.*
“ <i>Lyra</i> , Ehr.	“ <i>quatamalensis</i> , Ehr.
“ <i>septenaria</i> , B.*	“ <i>splendida</i> , Ehr.
“ <i>viridis?</i> Ehr.	“ <i>striatula</i> , Sm.
<i>Nitschia mesolepta</i> , B.* = <i>N. linearis?</i>	<i>Syringidium Americanum</i> , B.*
Sm.	“ <i>occidentale?</i> B.
“ <i>oblonga</i> , L. W. B.*	“ <i>simplex</i> , B.*
“ <i>punctata</i> , B.*	<i>Synedra acuta</i> , Ehr.
<i>Pinnularia interrupta</i> .	“ <i>Ulna</i> , Ehr.
“ <i>nobilis?</i>	<i>Tetragramma Americana</i> , B.
“ <i>dilata</i> , B.*	<i>Terpsinoe magna</i> , B.*
<i>Pleurosigma</i> —	“ <i>minima</i> , B.*
<i>Polymyxus coronalis</i> , L. W. B.*	“ <i>musica</i> , Ehr.*
<i>Pyxidicula?</i> <i>compressa</i> , B., MSS.	“ <i>Tetragramma</i> , B.*
<i>Stauroneis lineolata?</i>	<i>Triceratium alternans</i> , B.
<i>Stauroptera aspera</i> , Ehr.	“ <i>comptum</i> , Br.
“ <i>cardinalis?</i> Ehr.	“ <i>favus</i> , Ehr.
“ <i>lanceolata?</i>	“ <i>Shadboltii</i> , B.*
“ <i>parva</i> , Ehr.	<i>Zygoceros Rhombus</i> , Ehr.
<i>Striatella</i> .	“ <i>hemitropus</i> , B.*

To the above, most of which have been observed by both my father and myself, I can now add several other forms not observed by him. They are as follows :

<i>Cocconema</i> .	<i>Cymbella</i> .
<i>Triceratium megastomum</i> , Ehr.	<i>Spongiolites Agaricus</i> , Ehr.
<i>Ceratoneis?</i> <i>spiralis</i> , K.	<i>Amphora oblecta?</i> B.*
<i>Eupodiscus crassus?</i>	<i>Navicula firma</i> .
<i>Epithemia</i> .	<i>Rotalia</i> .
<i>Hyalodiscus Californicus</i> , B.	<i>Globigerina</i> , &c.

and several undetermined minute *Cocconeidæ*. Thus we have at least eighty-three distinct species occurring in the Para and Amazon, of which thirty would seem to be new. There are one or two other forms occurring here, which I believe to be undescribed, and which I may present at some future time. I pass now to the second portion of the plate, which includes forms also obtained during the cruise of the Dolphin, with the exception of Figs. F and G.

Figs. A, B. *AMPHORA OBTECTA*, *Bail.*, nov. sp. Frustules in front view barrel-shaped, with straight, truncated ends; in lateral view linear-oblong, with concave venter and convex dorsum; outer portions of valves canoe-shaped, nodules wanting or obscure; whole frustule covered with close, transverse striæ, which in front view intersect fine longitudinal lines or folds in the connecting membrane, giving the shell the appearance of being woven over.

*Hab.* Lat.  $0^{\circ} 19' 05''$  N., Long.  $45^{\circ} 43' 36''$  W.

This species has the general appearance of *Amphora ovalis*, but is somewhat larger, and may be distinguished by the woven-like appearance of its striæ.

Fig. C. *AMPHIPENTAS OBTUSA*, *Bail.*, nov. sp. Sides five, concave; angles conical; lateral surfaces slightly concave, minutely granulated; connecting membrane punctate in parallel vertical rows. Differs from *Amphipentas flexuosa*, B., MSS. in the sides being concave instead of gibbous.

*Hab.* Lat.  $0^{\circ} 19' 05''$  N., Long.  $45^{\circ} 43' 36''$  W.

This differs from *Amphitetras* only in the number of sides, and may be considered as an additional instance of their variability. The two preceding forms occur together.

*CYCLOTELLA? PULCHELLA*, *L. W. B.*, nov. sp. Disc small, with a central umbo, from near the base of which radiate (16) dilating styliform rays, which end upon the margin in large granules.

*Hab.* Lat.  $1^{\circ} 01' 29''$  N., Long.  $46^{\circ} 17' 46''$  W.

This species, which occurs together with a beautiful form, doubtfully referred to *Synedra fulgens* by my father, I have not been able to identify. There is, however, a species of *Cyclotella* occurring in the Para, which may be a variety of this species, and well deserves the above name. It is of the same size as the present form, but from the great difficulty of removing its carbonaceous matter frequently appears opaque. I have one specimen in which there are

sixteen rays, as above, which, however, are of different colors, giving the frustule the appearance of a four-colored star. This species may be distinguished from *C. antiqua* by its large granules on the rim. It may be *C.? radiata* of Brightwell, of which I have seen no figure.

Before dismissing the interesting forms obtained in the cruise of the Dolphin, it may be well for the sake of comparison with results obtained elsewhere, and which will be noticed in a subsequent paper, to give a list of the soundings not already described. These are four in number as follows:—

1. Lat.  $1^{\circ} 01' 29''$  N. Depth 43 fathoms. April, 1852.  
Long.  $46^{\circ} 17' 46''$  W.

CONTENTS.—Calcareous nullipores and corals. When washed the following were obtained.

*Stauroptera aspera*.  
*Synedra*.  
*Fragillaria?* in bands.  
*Pinnularia interrupta*.

*Grammatophora*.  
*Biddulphia pulchella*.  
*Coscinodiscus subtilis*.

Many large *Globigerinæ*, and soft parts of *Polythalamia*.

2. Lat.  $2^{\circ} 36' 52''$  N. Depth 58 fathoms. Long.  $47^{\circ} 45' 02''$  W.

*Nullipores* and large *Polythalamia*, which, on washing, yielded many sponge spicules, abundant *Fragillariæ*, *Navicula formosa?*, *P. interrupta*, and one specimen of *Syringidium*.

3. Lat.  $0^{\circ} 20' 58''$  N. 27 fathoms. Long.  $46^{\circ} 18' 31''$  W.

Fine quartzose sand, which yielded almost nothing by drying and floating. The fine washings gave some sponge spicules, some *Polythalamia* and *Diatoms*.

*Actinoptychus senarius*.  
*Amphora ovalis*.  
*Melosira sulcata*.  
*Navicula Lyra*.  
*Stauroptera aspera*.  
*Synedra*.

*Coscinodiscus lineatus*.  
*Triceratium favus*.  
*Biddulphia*.  
Plates of *Synapta tenuis*.  
*Quinqueloculina*.

4. Lat.  $0^{\circ} 32' 11''$  N. Long.  $46^{\circ} 51' 25''$  W. Same character as above, with some fragments of shells.

Actinóptychus, large, with 13 rays.

Amphora obtecta.

I conclude the consideration of these forms by giving the contents of a fifth sounding, made by the United States Coast Survey in the Gulf stream.

*Gulf Stream. Position 14. 150 fathoms.*

Green mud.

Orbulina universa.

Polythalamia, abundant, but small.

Textilaria, very abundant.

Coscinodiscus.

Marginulina Bachei, small.

Amphora.

Strophocornus, (common.)

Triceratium favus.

Triloculina.

" spinosum.

Biloculina serrata B.\*

Melosira sulcata.

Spines of Echinoderms.

Fig. E. BILOCULINA SERRATA, B., nov. sp. Perfectly smooth, opaque, porcelaneous, globose, with serrated margin, which is distinct on the under side, and indistinct on the upper.

Hab. Gulf Stream 150 fathoms.

Two other forms still remain to be described, which were found in a mass of earth from Honeylake Valley, at the foot of the Sierra Nevada, which was sent to my father by Dr. Stiel. The locality contains the following forms, besides the two new ones described below.

Epithemia, nov. sp? various forms.

Cocconema lanceolatum.

Gomphonema minutissima, abundant.

" aspera.

Stauroneis Baileyi.

Cymbella gibba, B.,\* common.

Discoplea atmospherica.

Campylodiscus, nov. sp?

Cocconeis.

Tabellaria trinodis.

Fig. F. CYMATOPLEURA? CAMPYLODISCUS, Bail., nov. sp. Large; lateral view almost circular, sometimes broadly oval; marginal striæ, close, short, and showing, under high powers, marginal gland-like dots. Lateral valve with one deep undulation, and surface faintly striated.



*Hab.* Honeylake Valley. Foot of Sierra Nevada.

Fig. G. CYMBELLA GIBBA, *Bail.*, nov. sp. Small; valves with very convex, almost conical dorsum; venter slightly convex; striæ fine and close.

*Hab.* Honeylake Valley.

I know nothing of the character of this locality, otherwise than by the species it contains. *Cymbella gibba*, B., is its most characteristic and abundant form.

As most of the preceding forms were discovered so long ago as 1854, it is highly probable that some, if not many of the forms here described as new, may have been seen and named by other writers. I have carefully searched all the books at my disposal, in order to avoid such multiplication of synonymes, but have found only one species, the *Syringidium Americanum*, B., which has as yet been published by other authors. I would also here say that any errors of description in the preceding remarks may be assigned to *my* observation, rather than to that of their first observer, although I have confined myself mostly to verifying his results, and have added nothing myself, of which I have not felt entirely sure. My thanks are due to Mr. Charles Stodder, of Boston, for many valuable suggestions.

In conclusion I would say, that a large amount of microscopic and botanical matter, which was in course of preparation for publication, still remains among the Memoranda of Prof. Bailey's Microscopic Collection, which I will endeavor to collect and complete at an early day.

